RESERVE ENGINE COOLING SYSTEMS

ANTIFREEZE SOLUTIONS AND TREATMENT FOR RUST

CONTENTS

1. GENERAL
2. PRECAUTIONS
3. COOLING WATER
4. RUST INHIBITOR
5. ANTIFREEZE
6. SEALER
7. ROUTINE CHECKS
8. COOLING SYSTEM SCHEMATICS

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1. GENERAL

1.1 This section covers the application of rust inhibitor and antifreeze in reserve engine cooling systems. Coordinate the information in this section with the engine-alternator sections in this handbook.

1.2 The term cooling system used here refers to radiators, engine water jackets, exhaust manifold water jackets, where provided, engine side of heat exchangers, immersion heater chambers and associated piping, tanks, and rubber hose. Various cooling system schematics are shown in Figures 1, 2 and 3.

1.3 Solutions containing ethyleneglycol often bring to light leaks not previously observed.

1.4 Consult the telephone company representative as to antifreeze requirements. He should indicate whether antifreeze is required and the temperature to which the cooling system must be protected. Follow local instructions as to type of antifreeze desired. Otherwise, refer to the list of approved materials in Paragraph 5.

1.5 Description

1.51 Rust inhibitor is a substance added to the cooling system of an engine to retard the formation of rust.

1.52 Antifreeze is a substance added to an engine coolant to lower the freezing temperature of the coolant. The amount by which the freezing temperature is lowered depends upon the type and quantity of antifreeze added.

1.53 Antifreeze is of two main types. The so-called "permanent" or Ethylene Glycol Type and the "nonpermanent" or alcohol (methanol and ethanol) type.

2. PRECAUTIONS

2.1 Antifreeze and rust inhibitor preparations are poisonous, some extremely so.

2.2 Ethanol (ethyl alcohol) and methanol (methyl alcohol) fumes are flammable and methanol fumes can cause blindness. Keep flames away from ethanol or methanol or containers that have held same. Observe all local ordinances pertaining to the use, handling and storing of alcohol.

2.3 Commercial products not listed in Paragraph 5 obtained under the names of methanol and ethanol may not contain rust inhibitor since "chemically pure" methanol and ethanol are merely forms of alcohol.

2.4 Do not use alcohol (ethanol and methanol) type antifreezes in diesel engines.

2.5 Only soft water should be used in engine cooling systems. See Paragraph 3.

2.6 Discard any rust inhibitor shipped with engines by the supplier. Use only the inhibitor listed in Paragraph 4.1.

3. COOLING WATER

3.1 Use only soft water in engine cooling systems. If the water used by a particular telephone company has been determined as satisfactory for use where heating is involved, as for example, in boilers, hot water systems, etc., it should be satisfactory for use in the engine cooling system.

4. RUST INHIBITOR

4.1 Rust inhibitor should always be added to the engine cooling water when antifreeze is not used. An acceptable rust inhibitor is "DuPont No. 7 Anti-Rust and Water Pump Lubricant" (liquid) which may be obtained locally. This inhibitor is compatible with any of the antifreezes listed in Paragraph 5. Any cooling system containing this inhibitor need not be drained before adding one of these antifreezes.

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4.2 The DuPont No. 7 Anti-Ruse and Water Pump Lubricant is generally distributed in 12 ounce cans. It should be added to the cooling system in the approximate proportion of 2-1/4 ounces per gallon of coolant or one 12 ounce can per 5-1/2 gallons of coolant.

4.3 The liquid inhibitor may be poured directly into the cooling system after running the engine long enough to bring the water up to 120° F or higher. After adding inhibitor, run the engine for at least 15 to 20 minutes to insure adequate mixing.

5. ANTIFREEZE

5.1 The following products are approved antifreezes for reserve engines:

NOTE: Only ethylene glycol type (Paragraph 5.13) is approved for use in diesel engines. Any of the three types may be used with a gasoline engine.

5.11 Ethanol Type (formerly alcohol)

Type N Ethanol Antifreeze - U.S. Industrial Chemicals, Inc.

5.12 Methanol Type

STA - Western Solvents & Chemicals Co.
Trek - National Carbon Co.
Zerone - E.I. duPont deNemours & Co.

5.13 Ethylene Glycol Type (Permanent)

APC Permanent Antifreeze and Anti-Rust - American Petrochemical Corp. (Tripoloil Refining Co.)
Frigitone - Firestone Tire & Rubber Co.
Pah-nol Permanent Antifreeze - Philip A. Houghton, Inc.
Permanent Antifreeze - Gulf Oil Corp.
Prestone - National Carbon Co. (Div. of Union Carbide Corp.)
Zerex - E.I. duPont deNemours & Co.

5.2 The following amounts of antifreeze required to protect one gallon of cooling solution to the temperature listed.

TABLE A

Anti-Freeze Type	Gallons of Antifreeze Per Gallon of Cooling Solution						
	+20F	+10F	Zero	-10F	-20F	-30F	-40F
Ethanol	.19	.29	.37	.45	.49	-	-
Methanol	.13	.20	.28	.35	-	-	-
Ethylene-Glycol	.17	.25	.33	.39	.45	.50	.53

NOTE: If decimals are dropped, the values are percentage by volume.

5.3 If the system is empty, pour approximately a gallon of soft water into the radiator or drain tank, pour in the antifreeze and add soft water until the radiator is full or the drain tank is filled to the correct level. Run engine for about 10 minutes to eliminate air pockets and add water if required. Filling to full will cause loss of solution through the overflow when the liquid expands with heat.

5.4 If this system is filled, drain out enough of the coolant to make room for the antifreeze. If the water contains any rust inhibitor other than the liquid DuPont No. 7 Anti-Rust and Water Pump Lubricant, as evidenced by records or by an amber to orange color of the coolant, run engine until coolant is at operating temperature, drain system completely and flush by filling system with water, operating engine for about 15 minutes and again draining. Then proceed as in Paragraph 5.3 to add antifreeze and fill the system.

5.5 Adding antifreeze in excess of the amounts shown in Table A does no harm except that:

5.51 Very high concentrations of methanol or ethanol type antifreezes tend to boil off causing poisonous fumes.

5.52 Ethylene - glycol types in concentrations above 60% give less protection than at lower concentrations. Undiluted ethylene-glycol protects to only 0 F.

5.6 Do not mix antifreezes of different types or even of the same type but made by different manufacturers.

6. SEALER

6.1 If leaks are observed in the cooling system, check water pump packing or hoses and replace as necessary. Tighten cylinder head nuts if necessary.

6.2 A cooling system sealer may be used to stop minor leaks. The sealer should be compatible with the antifreeze used. For example, "DuPont No. 7 Cooling System Sealer" should be used with Zerex antifreeze and "Prestone Sealer and Stop Leak" should be used with Prestone Antifreeze. These preparations should be obtained locally and used in accordance with the instructions on the container.

6.3 If rust inhibitor is used in the system but not antifreeze, either sealer may be used. However, if it is known that a particular antifreeze is to be used later, use the sealer that will be compatible with it.

7. ROUTINE CHECKS

7.1 Ethanol or Methanol solutions should be tested every 6 to 10 weeks during the cold season. Whenever substantial additions are made to replace evaporation, run engine 5 to 10 minutes to mix well and test with hydrometer. Hydrometers used by the telephone company for motor vehicle antifreeze testing are usually available and may be borrowed if these tests are necessary. To use hydrometer, draw enough liquid into jar to raise the float and then release pressure on bulb. Be sure float is floating but not touching at top of hydrometer jar. Read scale on float stem nearest liquid level in jar. Use data furnished

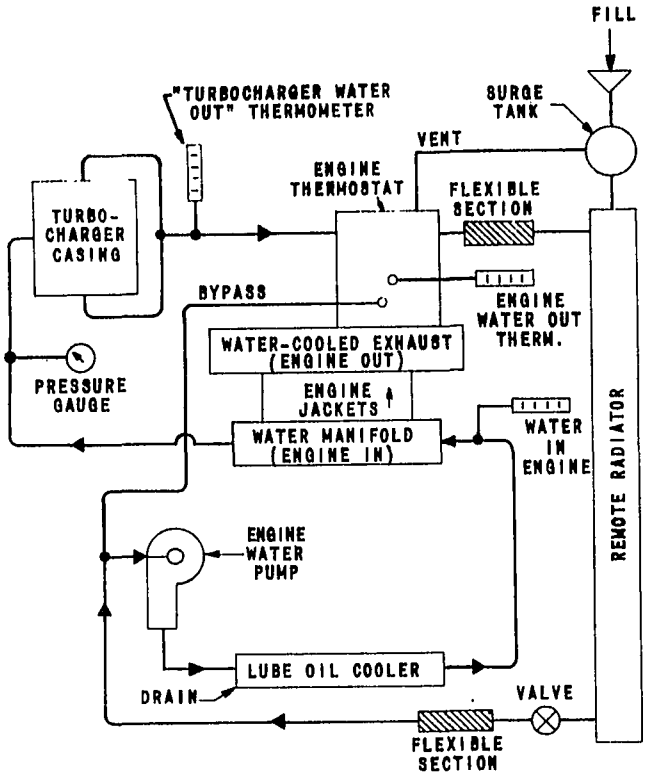
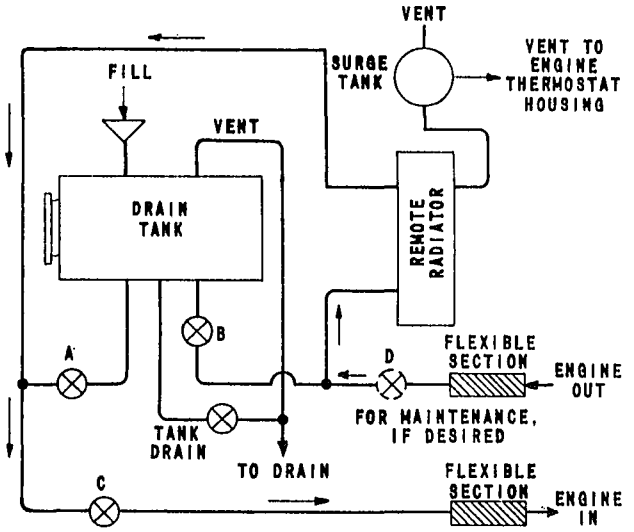
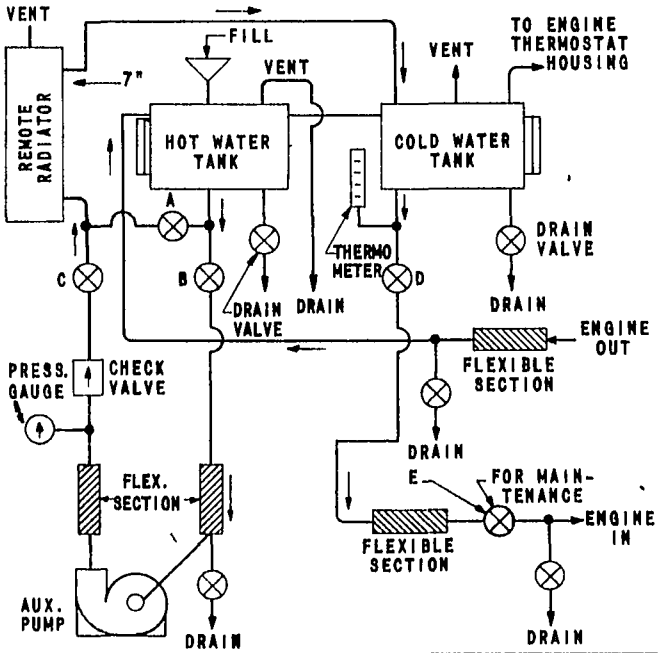


FIG. 1 RADIATOR ON SAME FLOOR AS ENGINE (PAR. 8.1)



OPERATION	VALVE POSITIONS	
	CLOSE	OPEN
1. TO FILL SYSTEM	ALL DRAINS	A, B, C, D
2. TO RUN ENGINE	B	A, C, D
3. AFTER RUNNING	-	B

FIG. 2 SINGLE TANK SYSTEM, NO AUXILIARY PUMP (PAR. 8.2)



OPERATION	VALVE POSITIONS	
	CLOSE	OPEN
1. TO FILL SYSTEM	ALL DRAINS, AND A	B, C, D, E
2. TO RUN ENGINE		B, D, E
3. AFTER RUNNING		A

FIG. 3 TWO TANK SYSTEM WITH AUXILIARY WATER PUMP (PAR. 8.3)

with hydrometer in conjunction with hydrometer reading to determine freezing temperature of liquid.

8. COOLING SYSTEM SCHEMATICS

8.1 Radiator on Same Floor as Engine

8.11 Figure 1 is the schematic of this system. Fill the radiator as follows: add to the top of the radiator or to a separate surge tank, if one is provided, until water level in the sight glass on the tank or radiator is at the half-full level.

8.2 Single Tank System, No Auxiliary Pump

8.21 Figure 2 is the schematic of this system. Fill the system as follows: with the engine not running add water to the drain tank until the gauge glass on the tank is about 3/4 to 7/8 full.

8.3 Two Tank System With Auxiliary Water Pump

8.31 Figure 3 is the schematic of this systems. To fill the system with the engine not running. Add water to either tank until water level in both tank sight gauges is about 1/4 inch below the top of the gauge glass.

→ Arrowed lines indicate new or changed information.

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Reason for Reissue:
To standardize the use of the liquid rust inhibitor, DuPont No. 7 Anti-Rust and Water Pump Lubricant and discontinue the use of R-3095 powdered Acid and Rust Inhibitor.

Replaces Section 133 dated 9-20-62.